What is claimed is:

1   1. A voice detector comprising:

2   a plurality of Goertzel filters each operating at a different frequency

3 within a voice range, some of the filters operating at frequencies of control

4 signals and others of the filters operating at frequencies other than the

5 control signals' frequencies, each filter for receiving a signal to be

6 analyzed for presence of voice and detecting energy of the signal at the

7 operating frequency of the filter; and

8   a comparator connected to the filters, for comparing the energies

9 detected by the filters against thresholds and responsive to at least three

10 of the filters simultaneously detecting energy above a noise threshold and

11 below a control signal threshold by indicating that the signal comprises

12 voice.

1   2. The voice detector of claim 1 wherein:

2   the comparator is responsive to a filter of the filters operating at a

3 frequency of a control signal and detecting energy above a control signal

4 threshold by indicating that the analyzed signal comprises the control

5 signal.

1   3. The voice detector of claim 1 wherein:

2   the comparator is responsive to one of the filters operating at a

3 frequency of a single-frequency control signal detecting energy above a

4 first control signal threshold by indicating that the analyzed signal

5 comprises the single-frequency control signal, and is responsive to two of

6 the filters operating at frequencies of a dual-frequency control signal each

7 detecting energy above a second control signal threshold different from

8 the first control signal threshold by indicating that the analyzed signal

9 comprises the dual-frequency control signal.

1   4. The voice detector of claim 1 further comprising:

2   a detector that detects total energy of the signal to be analyzed;

3 wherein

4   the comparator is responsive to the total detected energy being

5 below a noise threshold by indicating that the analyzed signal comprises

6 noise or silence.

1   5. The voice detector of claim 4 wherein:

2   the comparator compares the energies detected by the filters

3 against the thresholds by comparing ratios of the energies detected by

4 individual ones of the filters and the total detected energy against the

5 thresholds.

1   6. A call classifier comprising:

2   a plurality of Goertzel filters each operating at a different frequency

3 within a voice range, some of the filters operating at frequencies of control

4 signals and others of the filters operating at frequencies other than the

5 control signals frequencies, each filter for receiving windows of a signal to

6 be analyzed for presence of voice and detecting energy of the signal in the

7 windows at the operating frequency of the filter;

8   a detector that detects in the windows total energy of the signal to

9 be analyzed; and

10   a comparator connected to the filters, for comparing ratios of the

11 energies detected by the individual filters in a window and the total

12 detected energy in the window against thresholds, responsive to the total

13 detected energy in the widow not exceeding a noise threshold by

14 indicating that the analyzed signal comprises silence or noise, responsive

15 to one of the filters operating at a frequency of a single-frequency control

16 signal detecting energy whose ratio exceeds a first control signal threshold

17 by indicating that the analyzed signal comprises said single-frequency

18 control signal, responsive to two of the filters operating at frequencies of a

19 dual-frequency control signal each detecting energy whose ratio exceeds

20 a second control signal threshold by indicating that the analyzed signal

21 comprises said dual-frequency control signal, and responsive to at least

22 three of the filters each detecting energy whose ratio exceeds a voice

23 threshold by indicating that the signal comprises voice.

1 7. The call classifier of claim 6 wherein:

2 each window represents a different segment of the signal to be

3 analyzed.

1 8. The call classifier of claim 6 wherein:

2 each window represents a different tapered segment of the signal

3 to be analyzed.

1 9. The call classifier of claim 6 wherein:

2 each window represents a different segment of the signal to be

3 analyzed and wherein consecutive said windows partly overlap each

4 other.

1 10. A method of detecting voice in a signal to be analyzed for

2 presence of voice, comprising:

3 detecting energy of the signal at operating frequencies of a plurality

4 of Goertzel filters each operating at a different frequency within a voice

5 range with some of the filters operating at frequencies of control signals

6 and others of the filters operating at frequencies other than the control

7 signals' frequencies;

8 comparing the energies detected by the filters against thresholds;

9 and

10 in response to at least three of the filters simultaneously detecting

11 energy above a noise threshold and below a control signal threshold,

12 indicating that the signal comprises voice.

1   11. The method of claim 10 further comprising:

2   in response to a filter of the filters operating at a frequency of a

3 control signal detecting energy above a control signal threshold, indicating

4 that the analyzed signal comprises the control signal.

1   12. The method of claim 10 further comprising:

2   in response to one of the filters operating at a frequency of a single-

3 frequency control signal detecting energy above a first control signal

4 threshold, indicating that the analyzed signal comprises the single-

5 frequency control signal; and

6   in response to two of the filters operating at frequencies of a dual-

7 frequency control signal each detecting energy above a second control

8 signal threshold different from the first control signal threshold, indicating

9 that the analyzed signal comprises the dual-frequency control signal.

1   13. The method of claim 10 further comprising:

2   detecting total energy of the signal to be analyzed;

3   comparing the total detected energy against a noise threshold; and

4   in response to total detected energy being below the noise

5 threshold, indicating that the analyzed signal comprises noise or silence.

1   14. The method of claim 13 wherein:

2   comparing the energies detected by the filters comprises

3   comparing ratios of the energies detected by individual ones of the

4 filters and the total detected energy against the thresholds.

1   15. A method of detecting voice in a signal to be analyzed for

2 presence of voice, comprising:

3   detecting energy of the signal at operating frequencies of a plurality

4   of Goertzel filters each operating at a different frequency within a voice

5   range, some of the filters operating at frequencies of control signals and

6   others of the filters operating at frequencies other than the control signals

7   frequencies, wherein each filter receives windows of the signal to be

8   analyzed for presence of voice and detects energy of the signal in the

9   windows at the operating frequency of the filter;

10   detecting in the windows total energy of the signal to be analyzed;

11   comparing ratios of the energies detected by the individual filters in

12   a window and the total detected energy in the window against thresholds;

13   in response to the total detected energy in the widow not exceeding

14   a noise threshold, indicating that the analyzed signal comprises silence or

15   noise;

16   in response to one of the filters operating at a frequency of a single-

17   frequency control signal detecting energy whose ratio exceeds a first

18   control signal threshold, indicating that the analyzed signal comprises said

19   single-frequency control signal;

20   in response to two of the filters operating at frequencies of a dual-

21   frequency control signal each detecting energy whose ratio exceeds a

22   second control signal threshold, indicating that the analyzed signal

23   comprises said dual-frequency control signal; and

24   in response to at least three of the filters each detecting energy

25   whose ratio exceeds a voice threshold, indicating that the signal

26   comprises voice.

1   16. The method of claim 15 wherein:

2   each window represents a different segment of the signal to be

3   analyzed.

1   17. The method of claim 15 wherein:

2   each window represents a different tapered segment of the signal

3   to be analyzed.

1   18. The method of claim 15 wherein:

2   each window represents a different segment of the signal to be

3   analyzed and wherein consecutive said windows partly overlap each

4   other.